ENERGY CONSUMPTION GUIDE 72

Energy consumption in hospitals

BEST PRACTICE PROGRAMME

ENERGY EFFICIENCY

BEST PRACTICE PROGRAMME

CONTENTS

1 INTRODUCTION

Delivered energy is the metered power consumption of the hospital. For electricity, the primary fossil fuel consumption at the power station can be two and a half to three times as much.

While fossil fuel consumption in hospitals has been on a downward trend for the last 20 years, electricity consumption has been growing steadily. Electricity already accounts for around 18% of a hospital's delivered energy consumption and it represents over 50% of a hospital's energy costs.

This Guide presents benchmarks of consumption and energy costs, against which energy and estate managers can compare their hospital's actual performance and thereby identify how and where energy consumption can be reduced.

The production of this Guide has been sponsored by the Department of the Environment, Transport and the Regions (DETR) and the NHS in Scotland, with the support of NHS Estates, Welsh Health Estates, and Health Estates in Northern Ireland.

WHAT ARE BENCHMARKS AND REPRESENTATIVE VALUES?

This Guide introduces benchmarks and representative values for energy use in hospitals expressed in units of £/100 m³ and GJ/100 m³ per year, which represent the cost and energy respectively for a unit volume of the hospital. These provide performance indicators against which a hospital's actual energy and cost performance can be compared, in order to identify the potential for savings.

Benchmarks for total electricity and total fossil fuel consumption and cost have been produced using the 1995/96 annual energy returns for England[1], Scotland[2], and Northern Ireland[3] (which exclude laundries). These total consumption benchmarks can be broken down into a number of end uses.

The 'base load' is made up of domestic hot water services and process loads such as sterilizers, autoclaves and kitchen equipment, and includes site distribution losses. The benchmarks for base load are calculated on the 1995/96 annual energy returns for all Scottish hospitals which are approximately a tenth of all the UK hospitals.

DEFINITION OF GOOD PRACTICE AND TYPICAL VALUES

Two levels of performance are referred to in this Guide – ***good practice*** and ***typical***. ***Good practice*** values set an energy performance equalled or bettered by the top performing 25% of hospitals in the surveys. The ***typical*** values represent the average performance of all the hospitals surveyed. The difference in energy consumption between ***typical*** and ***good practice*** is around 20%. All hospitals should aim to achieve or better the ***good practice*** values.

The benchmarks for lighting are calculated on a smaller survey sample which is representative of lighting installations in all UK hospitals.

For other electrical uses, such as personal, medical, and IT equipment, the data gathered from the survey is insufficient for calculating definitive benchmarks. This Guide, therefore, provides representative values for those other electrical uses.

Figure 2 and table 4 show the total value for 'other electricity' uses.

The appendix includes water consumption benchmarks, based on a sample of 300 hospitals, published by the Audit Commission in its National Review, 'Untapped Savings' (May 1994).

ENERGY EFFICIENCY, THE ENVIRONMENT AND HEALTH

The burning of fuel and use of electricity causes atmospheric pollution. At a local level this reduces air quality, but globally the main environmental consequence is the emission of carbon dioxide (CO_2) which is causing global warming and is leading to climate change.

INTRODUCTION

In a typical acute hospital, the amount of energy consumed each year is equivalent to 16 tonnes of CO_2 per bed space or, in total, about 8700 m^3 of CO_2, which is enough to fill over 60 six-bed wards.

By reducing a hospital's energy consumption, it is possible to achieve the twin benefits of saving money and ensuring a less polluted environment for the local community.

Table 1 shows the mass of carbon and volume of CO_2 released into the atmosphere per 1 GJ (278 kWh) of fuel consumed.

Fuel	kg of carbon per GJ	m^3 of CO_2 per GJ
Electricity (1995/96)	39.4	78.0
Gas	15.2	30.0
Fuel oil (all types)	22.0	43.5
Coal (all types)	23.5	46.5

Table 1 Carbon and carbon dioxide emissions

ENERGY USE IN HOSPITALS

In this Guide, energy cost and consumption figures are given for four different types of hospital.

Teaching and specialist. These are large hospitals, usually over 30 000 m^3.

Acute and maternity. The bulk of NHS Trusts are in this group.

Cottage. This group includes short-term non-acute hospitals and cottage hospitals.

Long stay. Hospitals for the long-term care of the mentally ill, elderly patients or patients with learning difficulties.

2 BENCHMARKS

ENERGY CONSUMPTION BENCHMARKS

Figure 1 and table 3 show the annual delivered energy consumption for the four types of hospital described on page 5 of this Guide.

For NHS Trusts that contain more than one of the four hospital types, consumption will need to be apportioned to each of the hospital types so that a fair comparison can be made on a Trust by Trust basis.

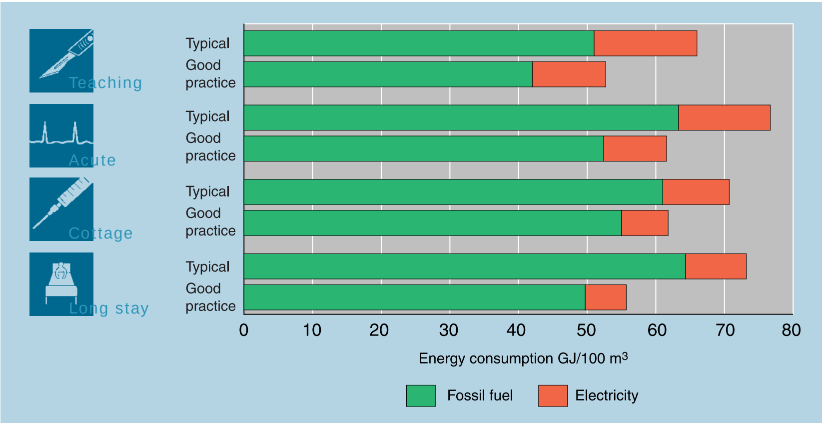

Figure 1 Good practice and typical benchmarks for total annual delivered energy consumption of hospitals (GJ/100 m³ heated volume)

ENERGY COST BENCHMARKS

Figure 2 and table 4 show annual energy costs, in £/100 m³ heated volume, according to end use. The figures show that, due to its high cost, electricity accounts for over half the energy bill for most hospitals. The total costs in figure 2 have been built up from the individual benchmarks for heating, base load and lighting, using the fuel prices in table 2.

'Other electricity' costs for services or equipment are shown as a single value, being the difference between the sum of the individual benchmarks and the overall total value.

If fuel tariffs differ significantly from those in table 2, costs in table 4 may be amended accordingly. Table 4 also shows how the 'other electricity' value is made up from a number of end uses.

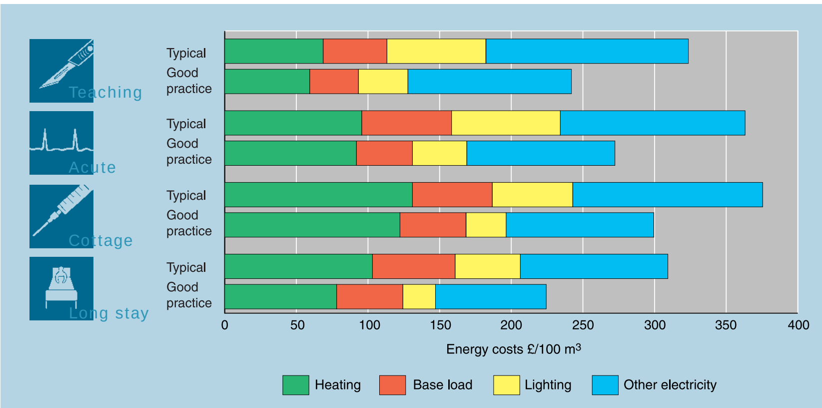

Figure 2 Annual energy costs, 1995/6 (£/100 m³ heated volume)

Hospital type	Fuel price (£/GJ)	
	Fossil	Electricity (delivered)
Teaching	2.22	13.90
Acute	2.50	15.29
Cottage	3.06	19.46
Long stay	2.50	16.68

Table 2 Fuel prices (£/GJ) used in figure 2

	Teaching		Acute		Cottage		Long stay	
	Typical	Good practice	Typical	Good practice	Typical	Good practice	Typical	Good practice
Fossil fuel	51.0	42.0	63.3	52.4	61.0	55.0	64.3	49.7
Electricity	15.1	10.7	13.4	9.2	9.7	6.8	8.9	6.0

Table 3 Good practice and typical benchmarks for delivered energy consumption of hospitals (GJ/100 m³ heated volume). See table 14 for assumptions

BENCHMARKS

The assumptions made for calculating electricity benchmark values and representative values are shown in table 14 on page 12.

BENCHMARKS (by end use)

	Teaching		Acute		Cottage		Long stay	
	Typical	Good practice	Typical	Good practice	Typical	Good practice	Typical	Good practice
Overall benchmarks*	321.7	242.0	363.2	279.3	375.5	300.6	309.3	224.4
Heating (A)	68.7	59.3	95.6	91.9	131.0	122.3	103.1	78.1
Base load (B)	44.5	34.0	62.7	39.1	55.7	46.0	57.7	46.2
Lighting (C)	69.0	34.5	75.9	37.9	56.7	28.4	45.5	22.8
All fossil fuel (A+B) (rounded)	113	93	158	131	187	168	161	124
All electricity (C+D) (rounded)	210	149	205	141	189	132	149	100

**The overall cost benchmarks are based on energy consumption benchmarks in table 3*

OTHER ELECTRICITY (representative values by end use)

	Teaching		Acute		Cottage		Long stay	
	Typical	Value to aim for	Typical	Value to aim for	Typical	Value to aim for	Typical	Value to aim for
HVAC	44.1	29.9	44.1	29.9	30.2	24.7	20.7	14.5
Other building services	23.1	20.6	24.9	22.4	31.6	24.4	27.2	20.4
IT equipment	11.5	10.3	12.4	11.2	3.9	3.0	3.3	2.5
Supplementary heating	5.4	4.8	5.7	5.2	14.6	11.3	12.6	9.4
Personal small power	24.1	19.0	26.6	20.9	33.8	26.6	29.0	22.8
Medical equipment	29.3	26.3	8.3	7.4	4.7	3.6	1.9	1.5
Catering	3.7	3.3	7.0	6.3	13.3	10.3	8.3	6.2
Total of representative values for other electricity uses (D)	141.2	114.2	129.0	103.3	132.1	103.9	103.0	77.3

(B) *The 'base load' is made up of domestic hot water services and process loads such as sterilizers, autoclaves and kitchen equipment, and includes site distribution losses*

(D) *Total representative is the aggregate of the individual representative values*

Table 4 Benchmarks and representative annual energy costs, 1995/6 (£/100 m³ heated volume)

3 ANALYSING FUEL CONSUMPTION

This section helps energy managers to analyse where energy is used in hospitals and, in some areas, suggests where savings can be made. The information provided includes benchmarks and representative levels of energy used by key equipment and systems.

A ceiling height of 2.9 m has been assumed for values and calculations in this publication. Table 5 shows the conversion factors for converting from kWh/m² to GJ/100 m³ for a range of ceiling heights. A worked example, using the benchmarks, is given on page 13.

To convert kWh/m² to GJ/100 m³, divide by the following:

Ceiling height (m)	Divide by
3.6	10
3.3	9.17
3.0	8.34
2.9	8.06
2.7	7.50

Table 5 Conversion from kWh/m² to GJ/100 m³

FOSSIL FUEL CONSUMPTION

Fossil fuel consumption, which typically accounts for over 80% of fuel consumed, has been falling steadily over many years. This is largely due to the investment in more energy-efficient plant and equipment and improved levels of insulation.

Heating accounts for the bulk of fossil fuel consumption, and the benchmark figures are shown in table 6. The base load figures are made up of domestic hot water services and process loads such as sterilizers, autoclaves and kitchen equipment, and includes site distribution losses.

Further reductions in fossil fuel consumption can be achieved by:

- decentralisation, especially of hot water generation
- replacement of existing plant with condensing boilers
- providing effective local control of heating and hot water
- installing combined heat and power (CHP).

Combined heat and power

Correctly designed and installed, CHP will provide valuable energy cost savings. Many hospital sites in the UK are suitable for some form of CHP, and it is recommended that every Trust should consider its introduction. The base load figures in figure 2 and table 4 indicate the potential for savings.

CHP installations result in a slight increase in fossil fuel consumption at the hospital site, but a reduction in bought-in electricity, leading to significantly lower overall energy costs and CO_2 emissions.

ELECTRICITY CONSUMPTION

Initiatives taken since the 1970's oil crisis have reduced fossil fuel consumption by hospitals, but electricity consumption has doubled. Although only about 18% of overall energy consumption is accounted for by electricity, it represents over 50% of the energy costs in a typical acute hospital. The overall benchmarks for electricity are shown in table 14 (along with the assumptions made in calculating the benchmark), although many hospitals will need to calculate their own customised benchmark (as shown on page 13).

Type of hospital	Heating (kWh/m² per year)		Base load (kWh/m² per year)	
	Typical	Good practice	Typical	Good practice
Teaching	249	215	163	124
Acute	308	296	202	127
Cottage	345	322	146	121
Long stay	332	252	186	149

Table 6 Benchmarks for fossil fuel consumption

ANALYSING FUEL CONSUMPTION

Type of hospital	All acute	Cottage	Long stay
Typical Assumptions	**40 kWh/m²** On 12 hours a day/7 days a week 38 mm fluorescent tubes 300 lux	**23.5 kWh/m²** On 10 hours a day/5 days a week plus a total of 9 hours over the weekend 38 mm fluorescent tubes 300 lux	**22 kWh/m²** On 8 hours a day/7 days a week 38 mm fluorescent tubes 250 lux
Good practice Assumptions	**20 kWh/m²** Fluorescent lighting with HF ballast Light fittings with reflective diffusers The installation of automatic lighting controls Minimum installed capacity (3 W/m² per 100 lux)	**12 kWh/m²**	**11 kWh/m²**

Table 7 Benchmarks for lighting

Lighting

Lighting is one of the major uses of electricity in hospitals. However, advances in lighting technology mean that energy savings of up to 50% can be achieved compared with lighting schemes only 10 years old. The savings come from improved control and improved efficiency. A ***good practice*** installed capacity benchmark for new lighting installations in office areas is 3 W/m² of floor area per 100 lux of the designed lighting level. This efficiency level is obtainable with high-frequency (HF) fluorescent lighting, low loss controls, and low-energy luminaires.

Table 7 shows lighting benchmarks, along with the assumptions made.

Heating, ventilation and air-conditioning

The electricity consumed by heating, ventilation and air-conditioning (HVAC) systems is largely dependent on the degree of control and the extent to which the building is insulated. Table 8 shows estimated typical consumption figures. The figures should be applied to the proportion of the hospital that has mechanical ventilation. The values can be used with the assumptions, as shown in table 14, in order to arrive at the cost values shown in table 4.

Fan power requirements are high in buildings that are poorly insulated and draughty, because of the need to distribute larger volumes of air. Poorly controlled air-handling units often operate at full speed for 24 hours a day. Linking the fans to a building energy management system (BEMS) and using variable-speed motor drives can reduce electricity consumption by over 50%.

A measure of the efficiency of the air-handling system is the specific fan power (SFP) in watts per litre/second (W per l/s). In a typical system the SFP is 3-5 W per l/s, while in an energy-efficient system it is nearer to 2 W per l/s.

Electricity for other building services

This is mainly electricity used by boilers and associated fuel storage and handling equipment, calorifier plant and hot-water circulation pumps.

	Poor control	With BEMS	With BEMS and control variable speed drive
Well-insulated building	30 kWh/m² per year (3.7 GJ/100 m³ per year)	21 kWh/m² per year (2.6 GJ/100 m³ per year)	14 kWh/m² per year (1.7 GJ/100 m³ per year)
Poorly insulated building	50 kWh/m² per year (6.2 GJ/100 m³ per year)	35 kWh/m² per year (4.3 GJ/100 m³ per year)	22 kWh/m² per year (2.7 GJ/100 m³ per year)

Table 8 Representative electrical consumption figures for HVAC

ANALYSING FUEL CONSUMPTION

The electricity consumption for building services will depend on:

- the size of the heating system – larger systems have longer pipe runs that require more pumping power
- the choice of boiler fuel – the only power requirements of gas boilers are for the burner fan and controls; oil needs pumping, and heavy or medium grades need electric trace heating, where trace heating is the significant cost.

Table 9 shows the electricity savings that can be made by switching from oil to gas and from centralised to decentralised boiler plant. Further savings of around 30% are possible by fitting pumps and fan motors with variable speed drives.

Information technology equipment

In acute hospitals there are typically 1.4 personal computers (PCs) per bed space. A typical PC, together with associated printer, etc, consumes 400 kWh annually if switched on for 40 hours a week, 50 weeks a year.

Type of heating fuel	Central plant (kWh/m² per year)	Decentralised plant (kWh/m² per year)
Gas	13	6
Oil	16	11

Table 9 Typical representative electrical consumption figures for boiler plant

Type of hospital	Typical total consumption (kWh/m² per year)	Value to aim for (kWh/m² per year)
Acute – teaching	6.7	6.0
Acute – non-teaching	6.5	5.9
Community	1.6	1.2
Long stay	1.6	1.2

Table 10 Representative total consumption for PCs

Many computers and associated items of equipment do not need to be left on all day. Encouraging staff to switch them off when not in use is the most effective way to reduce consumption. The specification for all new office equipment should be 'Energy Star' compliant. This 'powers down' the computer to save energy when the PC is not in use, provided that the facility is set on installation and not changed. For equipment that is not Energy Star compliant, turning off the monitor will save two-thirds of the PC's energy consumption. Although using a screen saver can sometimes save a small amount of electrical energy, it does not normally do so and should not be used as a substitute for switching off the computer or monitor (or activating other standby features). Thus, the consumption of a typical PC can be reduced from 360 kWh/yr to 120 kWh/yr simply by activating the standby facility. More advice on the running costs of office equipment, such as photocopying equipment, is given in Good Practice Guide 118 (see further reading on page 15).

Supplementary electric heating

The use of supplementary electric heaters brought in by staff is most prevalent in old, poorly insulated hospitals with poor control, where the heating system struggles to maintain comfort conditions. In modern, well-heated buildings supplementary heating is far less likely.

The old and poorly controlled buildings that were surveyed consumed up to 6 kWh/m² for supplementary heating. Ideally in new, well-designed and well-managed buildings the figure to aim for is zero.

Where supplementary electric heating is available, its use can be minimised by rebalancing heat emitters and reducing draughts. However, where small amounts of local electric heating allow the main heating system to be switched off it may prove to be more energy efficient.

ANALYSING FUEL CONSUMPTION

Personal small power

This covers all small power equipment that is not heating, lighting, IT or medical equipment, and includes staff residences where they are on the hospital site. It includes domestic type catering equipment such as kettles, electric cookers, toasters, microwaves and other electrical appliances including vending machines, televisions, stereos, vacuum cleaners, washing machines, etc. Controlling the consumption of small power items is mainly a management issue.

Typical	14 kWh/m² per year
Value to aim for	11 kWh/m² per year

Table 11 Representative consumption for small power loads (based on a small sample)

Medical equipment

The consumption figures in table 12 include small medical equipment, powered from a 13 A socket, as well as medical fridges, mortuary and pharmacy cold stores and laboratory equipment.

Typical levels of energy consumption for each hospital category are shown in table 12.

Hospital category	Typical consumption (kWh/m²)	Value to aim for (kWh/m²)
Acute – teaching	17.0	15.3
Acute – non-teaching	4.4	3.9
Community	2.0	1.5
Long stay	0.9	0.7

Table 12 Representative energy consumption for medical equipment

The consumption of larger items of medical equipment that require their own three-phase switchgear, such as X-ray machines, magnetic resonance (MR) scanners and linear accelerators should be added to these figures. It is beyond the remit of this Guide to suggest ways of reducing consumption by medical equipment, except to add that careful purchasing and good housekeeping practices can keep consumption to a minimum.

Catering

Energy consumption for catering will vary depending on the fuel used for cooking and whether the meals are cooked on-site or prepared as cook/chill meals off-site. Using gas for cooking, as opposed to electricity, is usually the most efficient use of fuel. Representative energy consumption values are given in table 13. If off-site catering is being considered, the power used by heated trolleys and its effect on maximum demand tariffs should be considered. Savings in energy consumption are possible, particularly by adopting good housekeeping practices.

Publications are available from the Energy Efficiency Best Practice programme that provide guidance on energy efficiency in catering establishments. These are listed under further reading on page 15.

Overall electricity benchmarks

The benchmarks and representative consumption values shown in figure 1 and table 3 on page 6 reflect the consumption levels covered in pages 9 to 11 of this Guide. Certain assumptions have been made in determining these benchmarks and representative values. The values and assumptions made are shown in table 14.

It is important to remember that the Health and Safety at Work Regulations place responsibility for the safety of all electrical appliances on the employer, regardless of ownership. This provides good reason to remove personal electrical equipment from hospitals.

ANALYSING FUEL CONSUMPTION

Cooking arrangment	Electricity (kWh)		Gas (kWh)	
	Per meal	Per bed/year	Per meal	Per bed/year
On-site preparation and electric cooking	0.5	548	–	–
On-site preparation and gas cooking*	0.3	328	0.29	314
Cooking and chilling on-site	0.9	986	–	–
Cold storage and regeneration of cook/chill meals	0.3	328	–	–

** It should be noted that electricity will be used even in a kitchen with gas cookers*

Table 13 Representative energy consumption values for cooking

Assumptions	Teaching	Acute	Cottage	Long stay
Percentage of hospital with HVAC (%)	66.0	60.0	25.0	20.0
Type of HVAC control	50% BEMS control	50% BEMS control	No BEMS control	No BEMS control
Percentage of buildings well-insulated (%)	25.0	25.0	None	None
Type of cooking	Gas	Gas 50% electric	50% gas	Gas
On-site laundry	No	No	No	No
Floor area per bed space (m^2)	156.0	90.0	80.0	83.0
Electricity consumption benchmarks (kWh/m^2)				
Typical	121.9	108.0	78.2	71.8
Good practice	86.3	74.5	54.8	48.4

Table 14 Assumptions made in determining the electricity benchmarks and representative consumption values

4 WORKED EXAMPLE

The benchmarks and representative consumption values shown so far in this Guide use the assumptions in table 14. Where a hospital differs from the assumptions, for example in the proportion of the Trust's buildings with HVAC or in the catering arrangements, it is possible to calculate a 'customised' energy consumption target. By comparing the customised target and actual consumption, it is possible to establish targets for fossil fuel and electricity consumption. The worked example below shows how this can be achieved.

EXAMPLE OF CUSTOMISED ENERGY CONSUMPTION TARGET

Consider a 600-bed acute teaching hospital, with a floor area of 55 000 m^2 of mainly 1960s buildings with full HVAC and catering that also supplies a nearby 300-bed hospital with meals.

A breakdown of the existing energy consumption for the hospital is shown in table 15, together with the equivalent target consumption using the appropriate ***good practice*** benchmarks and representative values from preceeding tables.

The existing electricity consumption of 160 kWh/m^2 is high for a teaching hospital. This is largely due to three factors:

- there is poor control of the mechanical ventilation system, which serves the whole of the hospital
- the lighting installation is old; much of it is on for long periods
- the kitchens supply cook/chill meals for an adjoining 300-bed hospital as well as for the main hospital facilities.

The existing fossil fuel consumption of 445 kWh/m^2 is also high because the heating system is poorly controlled. Its boilers are 12 years old and are less efficient than those currently available.

If the hospital adopted appropriate measures to achieve the good practice benchmarks, its fossil fuel consumption could be reduced to 339 kWh/m^2 and electricity consumption to 103 kWh/m^2, both below-average figures for a teaching hospital. These energy consumption figures represent realistic long-term targets. This would result in a reduction of 24% in fossil fuel consumption worth over £46 000 (with fuel at 0.8p/kWh) and 36% in electricity consumption, worth over £173 000 a year (with electricity at 5.5p/kWh).

	Existing situation		Good practice target	
	Actual consumption	**kWh/yr**	**Benchmark or representative consumption**	**kWh/yr**
Fossil fuels				
Heating	260 kW/m^2	14 300 000	215 kW/m^2	11 825 000
Base load	185 kW/m^2	10 175 000	124 kW/m^2	6 820 000
Total fossil	445 kW/m^2	24 475 000	339 kW/m^2	18 645 000
Electricity				
Lighting	35 kW/m^2	1 925 000	20 kW/m^2	1 100 000
HVAC	54 kW/m^2	2 970 000	22 kW/m^2	1 210 000
Other building services	14 kW/m^2	770 000	9 kW/m^2	495 000
Electric heating	Negligible	0	Negligible	0
Medical equipment	17 kW/m^2	935 000	15.3 kW/m^2	839 300
IT equipment	6.7 kW/m^2	366 850	6 kW/m^2	330 000
Personal small power	14 kW/m^2	770 000	11 kW/m^2	605 000
(1) Cooking/chilling+	0.9 kW/meal	886 950*	0.9 kW/meal	886 950*
(2) Food storage/regeneration	0.3 kW/meal	197 100**	0.3 kW/meal	197 100**
Total electricity	160 kWh/m^2	8 820 900	103 kWh/m^2	5 663 350

+The estimates for catering assume three meals per bed per day (see table 13 for energy consumption values per meal)
*These figures assume 600 occupied beds, 365 days per year (plus 300 beds at nearby hospital)
**These figures assume 600 occupied beds, 365 days per year

Table 15 An example of a customised energy consumption target

Calculations for meals

(1) Cooking (kWh/year) = $0.9 \times 3 \times 365 \times 900$

(2) Regeneration (kWh/year) = $0.3 \times 3 \times 365 \times 600$

APPENDIX – OTHER PERFORMANCE INDICATORS

ENERGY USE IN HOSPITAL LAUNDRIES

Energy Consumption Guide 49 'Energy efficiency in the laundry industry' gives guidance on reducing energy costs and is based on a survey of existing laundries.

The benchmarks from ECON 49 are as follows.

	kWh/kg of laundry	
	Fossil fuel	Electricity
Typical	2.45	0.208
Good practice	1.82	0.135

In hospitals, the average weight per item of laundry is 0.5 kg, and each bed generates about 4000 items per year. The above figures enable the energy use per bed to be calculated as follows.

	kWh/bed per year	
	Fossil fuel	Electricity
Typical	4920	416
Good practice	3640	270

Energy saving in laundries

The following measures were successful at cutting energy costs in the laundries visited.

- Recycle water – for example, use water from the final rinse for the next pre-wash.
- Use heat recovery – ie use the heat content of hot waste-water to heat clean incoming water.
- Lag pipework – don't waste heat from uninsulated pipes.
- Fit humidity sensors to dryers – avoids wasting energy from over-drying the laundry.
- Use direct firing of gas for tumble dryers and finishing equipment – gas is cheaper than electricity per kWh.
- Install calender covers – minimises the amount of heat lost to the atmosphere.
- Monitor and target – monitor energy use and set targets for reducing its use.

WATER CONSUMPTION IN HOSPITALS

Water, like energy, needs managing if waste is to be minimised. The Audit Commission in its National Review 'Untapped Savings' (May 1994) showed that water traditionally received little management attention. The report found that there was considerable scope for better management practice and consequent cost savings.

An analysis showed that the largest areas for potential savings were from installing water-conserving devices (such as urinal flush controls, WC dams and tap restrictors) and improving staff awareness.

Underground leaks were also reported to be a potential area for large savings. At one hospital, the location and repair of two long-term major leaks saved £100 000 a year. A simple rule of thumb for checking for major leaks is to look at the water demand profile of the hospital. If the base load is significantly greater than about 10% of the peak flow rate, this could be because of water leakage.

Water charges are, in part, determined by the size of the water meter. One hospital saved £6500 a year by down-sizing their water meter.

The benchmarks in figure 3 were produced as a result of the Audit Commission's investigation.

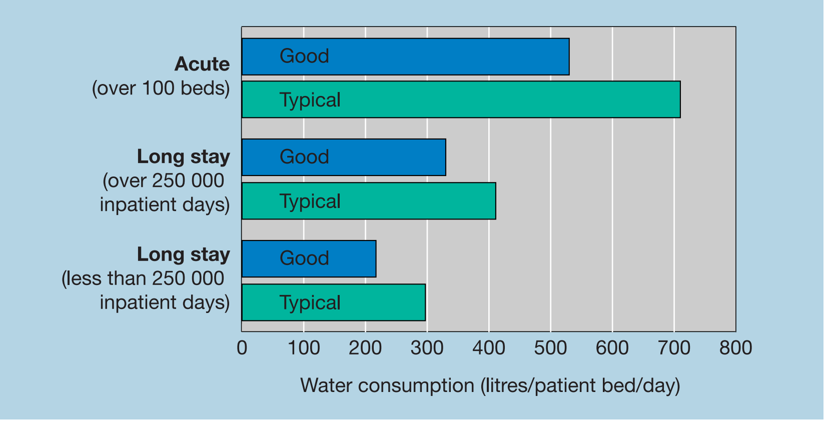

Figure 3 Water consumption benchmarks (based on a survey of 300 hospitals)

REFERENCES AND FURTHER READING

REFERENCES

[1] The estate in the NHS, TFP Central Returns Data Analyses 1991/2-1995/6, NHS Estates, May 1997.

[2] NHS in Scotland Estates Environment Forum: 1995/6 Energy Report, Healthcare Engineering and Environmental Unit, University of Strathclyde, 1996.

[3] HPSS Estate: Energy performance and usage 1995/6, Health Estates, HSS Trusts Unit of Management and Facility Report, 1996.

DETR ENERGY EFFICIENCY BEST PRACTICE PROGRAMME DOCUMENTS

The following Best Practice programme publications are available from BRECSU Enquiries Bureau. Contact details are given on the back cover.

Good Practice Guides

52 Good housekeeping in the NHS. A guide for energy and estate managers.

54 Electricity savings in hospitals. A guide for energy and estate managers.

60 The application of combined heat and power in the UK health service.

118 Managing energy use – Minimising running costs of office equipment and related air-conditioning

156 Energy efficient refurbishment of public houses – catering

160 Electric lighting controls – a guide for designers, installers and users

186 Developing an effective energy policy

200 A strategic approach to energy and environmental management

206 Energy efficient refurbishment of hospitals

222 Reduced catering costs through energy efficiency. A guide for kitchen designers, contract caterers and operators

Good Practice Case Studies

40 Energy efficiency in hospitals: condensing gas boilers

129 Energy Efficiency in Hospitals by good housekeeping. Somerset Health Authority

Introduction to Energy Efficiency booklet

2 Catering establishments

4 Health care buildings

The following Best Practice programme publications are available from ETSU Enquiries Bureau. Contact details are given on the back cover.

Energy Consumption Guide

49 Energy efficiency in the laundry industry

The Government's Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

Visit the website at www.energy-efficiency.gov.uk

For further information on:

Buildings-related projects contact:
Enquiries Bureau
BRECSU
BRE
Garston, Watford WD25 9XX
Tel 01923 664258
Fax 01923 664787
E-mail brecsuenq@bre.co.uk

Industrial projects contact:
Energy Efficiency Enquiries Bureau
ETSU
Harwell, Oxfordshire
OX11 0RA
Tel 01235 436747
Fax 01235 433066
E-mail etsuenq@aeat.co.uk

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy-efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting, etc.